Development of an Environmental Monitoring Package For the International Space Station

M. Ralph Carruth, Jr.*, Kenneth S. Clifton** and Michael T. Vanhooser+
NASA/Marshall Space Flight Center
Huntsville, Alabama 35812

ABSTRACT

The first elements of the International Space Station (ISS) will soon be launched into space and over the next few years ISS will be assembled on orbit into its final configuration. Experiments will be performed on a continuous basis both inside and outside the station. External experiments will be mounted on attached payload locations specifically designed to accommodate experiments and provide data and power from ISS. From the beginning of the space station program it has been recognized that external experiments will require knowledge of the external environment because it can affect the science being performed and may impact lifetime and operations of the experiments. Recently an effort was initiated to design and develop an Environment Monitoring Package (EMP) was started. This paper describes the derivation of the requirements for the EMP package, the type of measurements that the EMP will make and types of instruments which will be employed to make these measurements.

The ISS requirements related to the external environment are given in space station documents. They address the external contamination environment produced by ISS, the induced neutral and plasma environment, and the voltage between the ISS structure and the plasma. Included are the maximum flux rate of contaminants to surfaces due to outgassing of hardware and venting from station elements. There are specifically requirements for both quiescent and non-quiescent times. Specifications of the natural environment and definition of the expected perturbed levels of the environment due to both the physical presence of the space station in the ambient environment and its contribution to the environment by outgassing and venting are given. Monitoring by the EMP will provide specific data on the external environment to ensure that the values to which the ISS and payloads are designed are accurate. Actual data will allow more accurate evaluation of the effect of this environment on science, payload operations and lifetime.

The ISS requirements are meant to provide the payload community with a definition of the environment in which they will operate. Because the EMP will provide measured data which will more specifically define this environment, it is important to assess what requirements might be levied on the EMP to provide data to the attached payload community. A questionnaire was distributed to the user community through the ISS